Additional Instruction of 110119_STOCK Firmware

Note：The main difference of 110119_STOCK firmware between 100518_STOCK firmware is: 110119_STOCK firmware has totally 60 degree effective timing (Boosting Timing + Turbo Timing), while 100518_STOCK firmware has totally 29 degree.

Compared with the previous versions such as 1000518_STOCK, the 3rd generation STOCK firmware of "**110119_STOCK**" has the following improvements:

1. Stronger and quicker acceleration.
2. Boost Timing and Turbo Timing can be adjusted more smoothly, with the precision of 1 degree per step.
3. Turbo Timing and Boost Timing can be composited to be functional together (Total effective timing is up to 60°).
4. Turbo Timing increasing rate (slope rate) is adjustable.
5. Much more options for "Boost Start RPM" and "Boost Timing Acceleration".
6. Brake Force is changed from 4 options to 8 options.

CAUTION!

1. Once the 110119_STOCK firmware has been loaded into the ESC, you can only use the **LCD Program Box or PC software** to set the programmable parameters, neither the LED Program Card nor the SET button is available for programming the ESC with this new firmware.
2. You must update the firmware of the LCD Program Box to Version "110119" to be compatible with the 110119_STOCK firmware of ESC.

Note: When upgrade the LCD program box firmware to Version 110119, the upgrade process may be interrupted, please try it again. Usually the upgrade can be successfully finished at the 2nd time. We will solve this issue in the subsequent version.

HOW TO UPDATE THE FIRMWARE OF THE LCD PROGRAM BOX?

Please check here: http://www.hobbywing.com/upload/manual/USB_LINK_User_Manual.pdf

DESCRIPTION OF THE PROGRAMMABLE ITEMS ABOUT TURBO FUNCTION

#9.Boost Timing：It refers to the normal timing which is effective throughout the entire throttle range and affects the motor speed in the entire track (Curve and straight track). Please note this refers to the maximum value of the ESC internal timing, the actual timing is always dynamically changed every moment according to the motor RPM.

Boost Timing (Degree)	0° to 60° with the trim step of 1°

#10、Turbo Slope Rate (Degree/0.1s). It refers to the Turbo Timing increasing rate. The higher it is, the faster the Turbo Timing increases, and together with a quicker acceleration and higher motor temperature.

Item	1	2	3	4	5	6
Turbo Slope Rate (Degree/0.1s)	3°/0.1s	6°/0.1s	12°/0.1s	18°/0.1s	24°/0.1s	Full Turbo Timing opened immediately

Example: Turbo Timing is set to 24° and Turbo Slope Rate is set to 3°/0.1s, it takes 0.8S to activate this 24°Turbo Timing.

#12、Turbo Timing：It is the additional timing that added to the Boosting Timing and ONLY effective

when the throttle is fully opened, so usually it is useful for long straight track.

Turbo Timing (Degree)	0° to 40° with the trim step of 1°

The maximum amount of effective timing (Boot Timing + Turbo Timing) of the 110119_STOCK firmware is designed to 60°. If the sum of "Boost Timing + Turbo Timing" is more than 60°, only 60° is effective and the exceeding value is useless.

Example 1:

Boost Timing set to 60°, Turbo Timing set to 10°

60° timing can be activated before the throttle is fully opened, but no more timing can be activated after the throttle is fully opened.

Example 2:

Boost Timing set to 50°, Turbo Timing set to 10°

50° timing can be activated before the throttle is fully opened, and the further 10° timing can be activated after the throttle is fully opened.

Boost Timing	***Turbo Timing***	***Max timing before full throttle***	***Additional max timing after full throttle***	***Total Timing***	***Note***
48	*30*	*48*	*12*	*60*	*The "Additional max timing after full throttle" is only related to the "#10 Turbo Slope Rate" and "#14 Turbo Delay", it is not related to "#15 Boost Timing Acceleration"*
30	*10*	*30*	*10*	*40*	
20	*40*	*20*	*40*	*60*	
25	*40*	*25*	*35*	*60*	

＃13、Boost Start RPM： ESC begins to increase the internal timing when motor speed reaches the Boost Start PRM. A smaller Boost Start RPM value causes a faster rate of boost because the ESC increases the internal timing earlier.

Item	
Boost Start RPM (RPM)	1000 to 15000 RPM with the trim step of 1000 RPM

＃14、Turbo Delay： This is the amount of time "full throttle" must be held BEFORE the turbo function engages. If the full throttle time is less than the setting value, the turbo function will NOT be activated.

Item	1	2	3	4	5	6	7	8	9
Turbo Delay(s)	0s	0.1s	0.2s	0.3s	0.4s	0.5s	0.6s	0.7s	0.8s

＃15、Boost Timing Acceleration： This refers to the RPM increment that triggers the Boost Timing increase of 1 Degree. The lower value it is, the punchier the motor will be but conversely the hotter the motor will get.

Item	
Boost Timing Acceleration （RPM/Degree）	50 to 750 RPM/Deg, with the trim step of 50 RPM/Deg

This parameter is often misunderstood. The boost timing change is caused by the RPM increment, so we use this Boost Timing Acceleration parameter to control the increasing rate of Boost Timing.

So the change of RPM is the cause and the change of Boost Timing is the effect.

Generally, the larger the timing you set, the more powerful the motor will be, but hotter the motor will get. Motor may over-heat or even smoke if too much of timing is activated when a motor is running at a low speed. In order to solve the problem, we use the method of **dynamic timing**. The motor gets small amount of timing in the period of low speed, when the motor speed reaches the Boost Start PRM, then the timing begins to increases together with the RPM.

The Relationship between Speed and Timing			
Example 1 **Boost Start RPM** = 4000 **Boost Timing Acceleration** =200/degree		Example 2 **Boost Start RPM** =9000 **Boost Timing Acceleration** =400/degree	
Speed (RPM)	**Timing**	**Speed (RPM)**	**Timing**
<4000	0	<9000	0
4200	1	9400	1
4400	2	9800	2
4600	3	10200	3
4800	4	10600	4
5000	5	11000	5
5200	6	11400	6
5400	7	11800	7
5600	8	12200	8
5800	9	12600	9
6000	10	13000	10
6200	11	13400	11
6400	12	13800	12
6600	13	14200	13
6800	14	14600	14
7000	15	15000	15
7200	16	15400	16
7400	17	15800	17
7600	18	16200	18
7800	19	16600	19
8000	20	17000	20
8200	21	17400	21
8400	22	17800	22
8600	23	18200	23
8800	24	18600	24
9000	25	19000	25
9200	26	19400	26
9400	27	19800	27
9600	28	20200	28
9800	29	20600	29

10000	30	21000	30
10200	31	21400	31
10400	32	21800	32
10600	33	22200	33
10800	34	22600	34
11000	35	23000	35
11200	36	23400	36
11400	37	23800	37
11600	38	24200	38
11800	39	24600	39
12000	40	25000	40
12200	41	25400	41
12400	42	25800	42
12600	43	26200	43
12800	44	26600	44
13000	45	27000	45
13200	46	27400	46
13400	47	27800	47
13600	48	28200	48
13800	49	28600	49
14000	50	29000	50
14200	51	29400	51
14400	52	29800	52
14600	53	30200	53
14800	54	30600	54
15000	55	31000	55
15200	56	31400	56
15400	57	31800	57
15600	58	32200	58
15800	59	32600	59
16000	60	33000	60
>16000	60	>33000	60

Note: If the setting value of “Boost Timing” is less than 60°, for example, set to 20°, the Timing will be still 20° even if the motor speed is higher than 8000RPM in example 1.

SUMMARY

1. The way to get a higher top speed:
    A. Increase Timing
    B. Reduce FDR
    C. Increase acceleration
    If the straight track is not long enough AND the acceleration is not strong enough, soon the car needs to speed down at the end of straight track while the motor hasn’t got a high speed. In such a case, we may mistakenly think that the top speed is too low, but the real reason is the weakness of acceleration, so we need to increase acceleration.

2. The way to increase the start acceleration:
    A. Increase Timing
    B. Reduce Boost Start RPM or reduce Boost Timing Acceleration
    C. Increase FDR
    D. Reduce Turbo Delay
    E. Increase Turbo Slope Rate
    F. Increase Start Punch (This is the programmable item #4 of the ESC, please check the user manual of the ESC)
3. The way to decrease motor temperature and get a longer running time:
    A. Reduce Timing
    B. Increase Boost Start RPM or increase Boost Timing Acceleration
    C. Increase Turbo Delay
    D. Reduce Turbo Slope Rate

The table below is a recommended setting list. (2 cells Lipo, Motor endbell physical timing is 0° to 5°)

Car	Motor	FDR	#9 Boost Timing	#10 Turbo Slop Rate	#12 Turbo Timing	#13 Boost Start RPM	#14 Turbo Delay	#15 Timing ACC
1/10 On-Road	11.5T	6.0-7.0	30°-38°	18°/0.1s	16°-26°	4000	0.4s	300-450
	13.5T	5.0-7.0	30°-50°	18°/0.1s	20°-30°	3000	0.4s	200-300
	17.5T	5.0-7.0	30°-55°	18°/0.1s	20°-30°	3000	0.2s	150-300
1/10 Off-Road	11.5T	7.5-9.5	12°	6°/0.1s	4°	6000	Off	400-500
(Normally, turbo function is NOT	13.5T	7.0-9.0	16°	6°/0.1s	8°	5000	Off	200-350
recommended for Off-Road car)	17.5T	7.0-8.5	20°	6°/0.1s	12°	3000	Off	200-350

The FDR depends on the track condition. Generally, gearing down to get a higher top speed in the large track with long straight, or gearing up to improve the punch out of the corner in the small track.